CLAIMS:

1. A persistent p-type group II-VI semiconductor material comprising a thin film of a single crystal group II-VI semiconductor comprising atoms of group II elements and atoms of group VI elements, wherein the group II-VI semiconductor is doped with a p-type dopant, wherein the p-type dopant concentration is sufficient to render the group II-VI semiconductor material in a single crystal form, wherein semiconductor resistivity is less than about 0.5 ohm·cm, and wherein the carrier mobility is greater than about 0.1 $cm^2/V \cdot s$.

2. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the group II elements are selected from zinc, cadmium, alkaline earth metals, and mixtures thereof.

3. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the group VI elements are selected from oxygen, sulfur, selenium, tellurium, and mixtures thereof.

4. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the p-type dopant is selected from phosphorus, arsenic, antimony, bismuth, copper, and chalcogenides of the foregoing, and mixtures thereof.

5. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the resistivity is less than about 0.1 ohm·cm.

6. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the resistivity is less than about 0.01 ohm·cm.

7. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the resistivity is less than about 0.001 ohm·cm.

8. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the carrier mobility is greater than 0.5 $cm^2/V \cdot s$.

9. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the carrier mobility is greater than 4 $cm^2/V \cdot s$.

10. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the p-type dopant concentration is in the range from about 10^{16} to about 10^{22} atoms/cm^3.

11. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the p-type dopant concentration is greater than about 10^{16} atoms·cm^{-3}.

12. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the p-type dopant concentration is in the range from about 10^{17} to 10^{19} atoms·cm^{-3}.

13. A persistent p-type group II-VI semiconductor material according to claim 1, wherein the group II-VI semiconductor material is deposited as a thin film on an amorphous self supporting substrate surface.

14. A persistent p-type zinc oxide semiconductor material comprising single crystal zinc oxide that is doped with a quantity of arsenic, wherein the arsenic concentration is sufficient to render the zinc oxide a p-type semiconductor in a single crystal form, wherein semiconductor resistivity is less than about 0.5 ohm·cm, and wherein the carrier mobility is greater than about 0.1 cm^2/V·s.

15. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the resistivity is less than about 0.1 ohm·cm.

16. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the resistivity is less than about 0.01 ohm·cm.

17. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the resistivity is less than about 0.001 ohm·cm.

18. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the carrier mobility is greater than 0.5 cm^2/V·s.

19. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the carrier mobility is greater than 4 cm^2/V·s.

20. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the arsenic concentration is in the range from about 10^{16} to about 10^{22} atoms·cm^{-3}.

21. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the arsenic concentration is greater than about 10^{16} atoms·cm^{-3}.

22. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the arsenic concentration is in the range from about 10^{17} to 10^{19} atoms·cm^{-3}.

23. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the zinc oxide is deposited as a thin film on an amorphous self supporting substrate surface.

24. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the zinc oxide further comprises cadmium oxide.

25. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the zinc oxide further comprises magnesium oxide.

26. A persistent p-type zinc oxide semiconductor material according to claim 14, wherein the zinc oxide is a non-stoichiometric zinc oxide compound.

27. A persistent p-type zinc oxide semiconductor material comprising single crystal zinc oxide that is doped with a quantity of a antimony, wherein the antimony concentration is sufficient to render the zinc oxide a p-type semiconductor in a single crystal form, wherein semiconductor resistivity is less than about 0.5 ohm·cm, and wherein the carrier mobility is greater than about 0.1 $cm^2/V \cdot s$.

28. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the resistivity is less than about 0.1 ohm·cm.

29. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the resistivity is less than about 0.01 ohm·cm.

30. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the resistivity is less than about 0.001 ohm·cm.

31. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the carrier mobility is greater than 0.5 $cm^2/V \cdot s$.

32. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the carrier mobility is greater than 4 $cm^2/V \cdot s$.

33. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the antimony concentration is in the range from about 10^{16} to about 10^{22} atoms·cm^{-3}.

34. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the antimony concentration is greater than about 10^{16} atoms·cm^{-3}.

35. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the antimony concentration is in the range from about 10^{17} to 10^{19} atoms·cm^{-3}.

36. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the zinc oxide is deposited as a thin film on an amorphous self supporting substrate surface.

37. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the zinc oxide further comprises cadmium oxide.

38. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the zinc oxide further comprises magnesium oxide.

39. A persistent p-type zinc oxide semiconductor material according to claim 27, wherein the zinc oxide is a non-stoichiometric zinc oxide compound.

40. A persistent p-type zinc oxide semiconductor material comprising single crystal zinc oxide that is doped with a quantity of a p-type dopant selected from copper oxide, antimony oxide, bismuth oxide, wherein the dopant concentration is sufficient to render the zinc oxide a p-type semiconductor in a single crystal form, wherein semiconductor resistivity is less than about 0.5 ohm·cm, and wherein the carrier mobility is greater than about 0.1 $cm^2/V \cdot s$.

41. A persistent p-type zinc oxide semiconductor material according to claim 40, wherein the p-type dopant is copper oxide at a dopant concentration from about 3 to about 10 mole %.

42. A persistent p-type zinc oxide semiconductor material according to claim 40, wherein the p-type dopant is antimony at a dopant concentration from about 1 to about 10 mole %.